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# On the Rhythmic Activity of the Oesophagus and the Influence upon it of various Media

by

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# On the Digestive Activity of the [illegible] and the Influence upon it of various Salts

## Introductory

Although [illegible] many [illegible] of [illegible] in these [illegible] [illegible] commonly under the [illegible] of the [illegible] and [illegible] [illegible] of [illegible] and difficult [illegible] of [illegible] several [illegible] the [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible] the higher [illegible] [illegible] and [illegible] with [illegible] that the [illegible] [illegible] of [illegible] in [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] by the [illegible] [illegible]. In the [illegible] of the [illegible] we have a [illegible] [illegible]

maintained that the detachment of the [illegible] upon the blood is of a chemical nature, [illegible] [illegible] [illegible] [illegible] [illegible] of [illegible] [illegible]. [illegible] this conclusion by observing the dispersing effect of irrigation with [illegible]. [illegible] [illegible] since the year 1893 Hamburger and his associates have investigated the [illegible] of the [illegible] [illegible] in [illegible] [illegible] the [illegible]. In so doing they seem to have underestimated the role of [illegible] [illegible] the [illegible] [illegible] [illegible] that the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of [illegible] [illegible] of [illegible] [illegible] [illegible] [illegible] [illegible] of a suitable [illegible] [illegible] [illegible] [illegible] [illegible] or [illegible]. The [illegible]

of quantity of yeast, desirable results can be expected, leading bakers prepared to take up the usage of such salts and chemical improvements ....

The importance of mineral salts in the fermentation industry was first shown by [illegible] who found the salts of [illegible] to be of great value for yeast nutrition and [illegible] showed the importance of a mixture of salts in a medium richer than the normal salts of the fermentation. He did not discover the specific effects of different salts upon the yeast. [illegible] followed on the factors concerning the favorable action of [illegible] [illegible] [illegible] that the nutrition of these salts in [illegible] of [illegible] is most efficient in [illegible] the [illegible] values for [illegible] [illegible] [illegible]

has made no attempt to enlarge the portion, of the mathematical results on the experiments to be derived but merely to define the conditions under which the velocity of energy propagation [illegible] the [illegible] property of wave velocities.

# Visceral Clefts of the Neck

The research and [illegible] of the recent half of century, the influence of numerous histologists [illegible] more [illegible] results [illegible] especially by the [illegible] of [illegible] and the [illegible] [illegible]. It [illegible] [illegible] to the [illegible] of [illegible] [illegible] the [illegible] hypothesis [illegible] and [illegible] [illegible] the [illegible] [illegible]. It is [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] of [illegible] [illegible] of [illegible] [illegible] the [illegible] [illegible] [illegible] to the [illegible] [illegible]. [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] which have been called [illegible] and

nearly unanimous on the validity of [illegible] and of [illegible]. Some of these deserve to [illegible] and analyse the other people's views, especially as [illegible] holds [illegible]. Others take the topic as [illegible] the critical [illegible] is a [illegible] [illegible].

The [illegible] claims for [illegible] was a [illegible] of [illegible] from the [illegible] of the [illegible], one of the [illegible] of [illegible] of this [illegible] [illegible] movements. [illegible] has [illegible] of the [illegible]. [illegible] has produced [illegible]. [illegible] and [illegible] have [illegible] the [illegible] of [illegible] [illegible] Traditional [illegible]. In the [illegible] of [illegible] it was [illegible] that the [illegible] is to be [illegible] by [illegible] of the [illegible] for the [illegible] [illegible] from the [illegible] and [illegible] [illegible]

which commonly are so numerous and successful in their lives. Hence they [illegible] [illegible] [illegible] but [illegible] [illegible] [illegible]. The [illegible] in [illegible] the [illegible] [illegible] of the [illegible] [illegible] of [illegible] [illegible] [illegible] and [illegible] [illegible] [illegible] no [illegible] [illegible] [illegible] [illegible] the [illegible] of the [illegible] and [illegible] of the [illegible] [illegible] [illegible] [illegible] and [illegible] by [illegible] [illegible]. The [illegible] made by the [illegible] [illegible] [illegible] [illegible] as well as [illegible] [illegible] [illegible] [illegible] of [illegible] [illegible] of the [illegible] [illegible] and [illegible] and [illegible] [illegible] that in the [illegible] [illegible] the [illegible] [illegible] [illegible] the [illegible] [illegible] is [illegible] [illegible] that in the [illegible] of [illegible] [illegible] ([illegible]) [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] that the may have a [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible] and [illegible]. [illegible]

any changes in the rate of the flow.

## Method of Treatment.

As is well known [illegible] [illegible] [illegible] the [illegible] [illegible] of the [illegible] a [illegible] and [illegible] a former study which was made by these simultaneous [illegible]. The method of investigation [illegible] similar to that described by Doyle(15) and [illegible] for [illegible] from the [illegible] [illegible] and [illegible] that [illegible] [illegible] had described by Doyle [illegible]. It was found that the [illegible] each part of the [illegible] used it was made that [illegible] in the [illegible] of a glass jar, and [illegible] the [illegible] a [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible] to a [illegible] glass [illegible] [illegible] [illegible] [illegible] [illegible] by [illegible]. The [illegible] was [illegible] by the [illegible] of a [illegible]

placed upon the anterior part of the first [illegible] of a [illegible]

[illegible]

[illegible] were [illegible] by [illegible] [illegible] using normal eggs (No. [illegible]) there is a much greater difference between the pharyngeal end and the region adjoining the stomach. [illegible] [illegible] [illegible] in a small [illegible]. Fragments [illegible] [illegible] gave the following results.

Gastrulae

|  | Normal | [illegible] |
|---|---|---|
| 1st hour | 144 | 34 |
| 2d hour | 136 | 17 |
| 3d hour | 134 | 53 |
| 4th hour | 139 | 81 |

Comparison of these two records shows that the [illegible] of the [illegible] [illegible] with the same [illegible] and they [illegible] [illegible] [illegible] at the first [illegible].

[illegible] of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] merely upon the personal [illegible] of hotel operators or the [illegible] management of them. Nowadays, hotel menus are designed by trained [illegible] made by the manage-ment [illegible] the [illegible] is very important [illegible] made by the [illegible] in [illegible] of the [illegible] and the restaurants are [illegible] than [illegible] of the [illegible] is not much more than an [illegible] part of the hotel.

Before [illegible] the institution of the large [illegible] of the first [illegible] as have [illegible] and the [illegible] much of the [illegible] and [illegible] The [illegible] of [illegible] the [illegible] that [illegible] and [illegible] able to [illegible] in [illegible] them.

[illegible]

[illegible] 200 - 300 ft. [illegible]

[illegible] 10 [illegible]

[illegible] 15 - 20 [illegible]

[illegible]

[illegible]

[illegible] 0.002 - 0.11 % [illegible]

[illegible]

[illegible] 0.015 - 0.05 % [illegible]

[illegible]

[illegible]

under the reaction of the different solutions.

## Delicacy of Nessler's Reaction.

It is evident from the figures of table I and II that the conclusions reached years ago and accepted for many years by [illegible] Nessler's (2) reagent is such that the reagent is a delicate reaction reagent for NH3 to the extent of [illegible] to [illegible] and by [illegible] is [illegible] from the amount of error indicated by the solution of ammonium [illegible] [illegible] [illegible] is less than [illegible]. That the [illegible] the highest [illegible] [illegible], [illegible] and that made in the [illegible] is [illegible] [illegible] [illegible] an hour after [illegible]

along that full span. The same will serve [illegible] [illegible] of both phases. Successive excitations [illegible] higher than, then, [illegible] and successive sensations [illegible] [illegible] [illegible]. When the stimulus had a well established the tone and also the conditions of [illegible] was [illegible] gradually [illegible] by a long time. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] in the [illegible] [illegible] of a stimuli the [illegible] [illegible] a tendency to [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] or the [illegible] when the first [illegible] in the [illegible] [illegible]

Duration of Stimuli. [illegible] found that the [illegible] from the [illegible] [illegible] [illegible] in a [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] as the [illegible] [illegible] [illegible] [illegible]

but diminish in the breadth. NaCl solution [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] shifting in the direction of [illegible] [illegible].

Fig. 8 shows the [illegible]. The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] different amounts of the chloride in the same [illegible] of a constant quantity of [illegible], [illegible] with [illegible] in [illegible] of the [illegible] [illegible] the band is [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] when the [illegible] is [illegible] [illegible] [illegible] [illegible] the [illegible] of the [illegible]. [illegible] [illegible] [illegible] the

[illegible]

## [illegible]

[illegible]

[illegible] was [illegible] by [illegible] only [illegible]

It was found that the [illegible] of a small quantity of [illegible] by [illegible] the solution [illegible] may be [illegible] of [illegible] and [illegible] 0.05% [illegible]

When [illegible] the [illegible] of [illegible] could be [illegible] by [illegible] the [illegible]

# [illegible] of the Results for 1917.

The [illegible] [illegible] of [illegible] and [illegible] [illegible] [illegible] [illegible] may [illegible] [illegible] against the [illegible] [illegible] is [illegible] by the maintenance of [illegible], and [illegible] [illegible] [illegible] [illegible] may be [illegible] [illegible] [illegible] the [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible] as in the [illegible] [illegible] [illegible] the [illegible].

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] that [illegible] [illegible] and [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

[illegible] with the [illegible] of the components in [illegible] [illegible] [illegible] [illegible] [illegible], is the only [illegible] in [illegible] of [illegible]

[illegible] [illegible] has been found that [illegible] [illegible] of [illegible] in [illegible] the [illegible] [illegible] [illegible] [illegible] the [illegible] and [illegible] of the [illegible] in [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] analysis, [illegible] [illegible], amounting 0.02 % or [illegible] [illegible] the [illegible] 0.03 % [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] this point it seems that the [illegible] was [illegible] [illegible] [illegible] but this is not clearly confirmed [illegible] the [illegible]

NaBr. The halogen used was equivalent
in every [illegible] [illegible] with [illegible]
[illegible] it was then added gradually, in
[illegible] [illegible] [illegible] the [illegible] [illegible]
being the [illegible] [illegible] [illegible] the [illegible]
of a definite time. In the present case,
for it seems that the equilibrium would
must be favorable to a [illegible] [illegible]
and a [illegible] [illegible] with [illegible] formula [illegible]
but it, did not appear to be appreciably
less than the [illegible] time. The distinction
[illegible] the action of NaBr, and that of
NaBr [illegible] be carried out.

(a). It is possible to explain the
NaCl [illegible] [illegible] [illegible] NaBr [illegible] the
result [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] the [illegible] [illegible] [illegible] than the
[illegible] of the [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] The

[illegible] [illegible] [illegible] [illegible] the [illegible]
[illegible] for [illegible] in an [illegible] [illegible]
[illegible] of the [illegible] [illegible] by the
[illegible] [illegible] [illegible] of the [illegible] [illegible]
[illegible] the [illegible] that the [illegible] has a
tendency to increase [illegible] and to [illegible]
the [illegible] of [illegible] [illegible] is that
the [illegible] of [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] The [illegible] was not the
[illegible] [illegible].

[illegible] Finally, [illegible] may be [illegible]
[illegible] by [illegible] [illegible] and [illegible] [illegible]
that [illegible] might be [illegible] by [illegible]
[illegible] and [illegible] [illegible] of [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] to be [illegible] by the
[illegible] [illegible] [illegible] of [illegible] [illegible] of
[illegible] of [illegible] from the [illegible] of the
[illegible] [illegible] by the [illegible] of [illegible]
the [illegible] may be [illegible] from [illegible] in

effects of Salivary [illegible] under such [illegible] as some of the others. The addition of 1% of [illegible] chloride salt, 0.7% NaCl. If a Ringer's Solution is made up using [illegible] instead of chloride, potassium KCl and [illegible], in the case of ammonia the culture [illegible] [illegible] in [illegible] [illegible] to [illegible]. This [illegible] is an increased concentration of the movements but they are gradually slowed and the heart [illegible] comes finally to stand-still within twenty minutes. When such a [illegible] that is [illegible] returned to normal Ringer it does not beat at once. It may be quiescent for an hour or more but the beat is finally sure to be resumed and the solution seems to have no lasting effect. The same will [illegible] a large percentage of the sodium of a [illegible] [illegible] of chloride (or [illegible] salt) is [illegible] on the [illegible]. The question of

the NaCl that may be replaced by organic salts without producing the injury of the heart is variable. It is safe to say that one half the NaCl may be so replaced by acetate without materially lessening the vigor of the contractions. Sometimes the substitution can be pushed farther and hearts may beat for hours in solutions containing but in every three parts of the organic salt to one of the inorganic. This was shown most successfully by trials with sodium formate and sodium butyrate. In the presence of an excess of the organic salt, the way in which the contractions cease is usually abrupt. It should be noted that these sodium salts in the concentrations employed are largely dissociated. This precludes the inference that the inhibitory effect caused by them is due to a lack of Na ions.

When [illegible] to be chemically [illegible]

[illegible]

KCl. The repeated experiments, however, seem merely to hold only for at least 1% more KCl, is added until the amount is 0.1-0.15%. From here on there comes the possibility on [illegible] [illegible] the pulse becomes and the heart beats a depressed rhythm. It is true that in this case the Cl ions are increased but the increase is probably due to the added Na. Since [illegible] has found that a small quantity of a soluble sulphate added to NaCl solution is known to [illegible] rhythmic activity of the isolated heart of the frog, and would [illegible] take the place of Cl, this has not been observed in the present investigation. On the contrary, the results are in harmony with the [illegible] show that Ringer solution with $H_2SO_4$ is depressing to the heart in a greater degree than Ringer solution with other acids.

The normal Ringer's Solution was saturated with $Ca_3(PO_4)_2$ and held a very limited quantity of this salt in solution. It is probable that there is not as much Ca in $Na_2HPO_4$ solution as in $CaCl_2$, for it is rapidly precipitated from the bath when $Na_2HPO_4$ is added. A small addition of $Na_2HPO_4$ inhibits the movements of the strips. As little as 0.01% inhibits them. $Na_2HPO_4$ is strongly alkaline and when it was to be added in quantity it was neutralized with $H_3PO_4$. The effect of such a neutral phosphate Ringer is without question. Recovery in normal Ringer is prompt and good. Phosphate solutions must be compared with solutions of $Na_2SO_4$ as possible precipitants of Ca.

The oxalates are the best precipitants and the inhibiting effect of this substance is

as marked as Howell has shown it to be for the heart. The addition of 0.01% of $Na_2C_2O_4$ to the medium speedily brought the most vigorous segmentation to end with tonus loss. There is no evidence that the oxalate has any lasting harmful effect for a fresh Ringer's solution quickly brings to the resting strip and the rate immediately assumes the character it had before the intoxication. It should be mentioned at this point that $K_2C_2O_4$ does not inhibit the movements of a skeletal muscle when it is twitching in NaCl but instead [illegible] increases them. This fact emphasizes the fundamental difference between the contractions of skeletal muscles which occur for long periods in a bath of NaCl alone (i.e. a condition which is not physiological) and those of the esophageal strip, as

that its presence has been long recognized unless [illegible] use of [illegible] supplied in physiological amounts.

Salts that exhibit [illegible] properties on Na — several salts show detrimental effects not to be explained as due to the removal of Na.

KCl is one of these. It has the depressing effect of the potassium ions and produces loss of tone, slowing of the contractions and finally standstill.

Inhibition is generally brought about by as little as 0.03% of the salt [illegible] in [illegible].

In this [illegible] sodium [illegible] and sodium [illegible] have an effect [illegible] nearly similar to that of the [illegible] particles in the solution (1.0) [illegible] with [illegible] of tone and [illegible] the [illegible]

is transferred is covered. Hence the quantity is greatest and smallest. From the above point of the number of molecules which they contain these data are exceedingly small for a solution of which the salt contents was 0.7% - [illegible] [illegible] 10% [illegible] is comparable to [illegible] with a molecule of [illegible] [illegible] one molecule in a hundred of NaCl.

Solvent [illegible] is another fact which [illegible] and [illegible] [illegible] the conductivity of the [illegible] [illegible] of the [illegible] [illegible] (1.3) of the NaCl [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] and [illegible] [illegible] that [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] to [illegible] [illegible] [illegible] for the [illegible] of the [illegible] [illegible] the [illegible]

Salicine, Salicylate of soda [illegible] tried and the introduction of [illegible] of the sulphate to cause severe diarrhea.

Thus the gloomy and beginning of the rheumatic disease in the history of the Hospital is [illegible] a mere [illegible] after [illegible] the [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] is [illegible] and [illegible] [illegible] is necessary to [illegible] the [illegible] in order to [illegible] the effects of the [illegible] [illegible] [illegible] the [illegible] [illegible] to [illegible] a medical [illegible] [illegible] [illegible] [illegible] but all [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] of [illegible] [illegible] [illegible] [illegible] of the [illegible] [illegible] [illegible] [illegible]

[illegible] and [illegible] general capacity. The [illegible] effects chiefly the degree of [illegible] and possibly one of the effect of [illegible] upon [illegible] results.

## [illegible] of [illegible]

These statements have little bearing on the much discussed question of the origin of these and complex [illegible] phenomena [illegible] [illegible] of [illegible] in the [illegible] [illegible]. Studies on the [illegible] of the [illegible] and [illegible] of [illegible] and [illegible] so [illegible] [illegible] and the [illegible] of the [illegible] have tended to show that these [illegible] [illegible] arise from the influence of [illegible] cells. [illegible] has taken the [illegible] general [illegible] that the [illegible] [illegible] [illegible] in [illegible] [illegible]

[illegible] by [illegible] [illegible] [illegible] pro-
gressively [illegible] [illegible]. He believes that
he has demonstrated that by increasing doses
of stimuli with alcohol and nicotine.
Under such conditions he found that the
[illegible] [illegible] were found to be
[illegible] [illegible] [illegible]. The results obtained
and [illegible] of [illegible] [illegible] in [illegible]
[illegible] and [illegible] [illegible] [illegible]
has [illegible] in the [illegible] of [illegible], and
has pointed out that the [illegible] of the
[illegible] [illegible] are [illegible] [illegible]
relatively large doses of alcohol and nicotine
are [illegible], and that the effect of these
[illegible] is [illegible] [illegible]. It is [illegible] [illegible]
the data of [illegible] in this [illegible] [illegible]
[illegible] of [illegible] [illegible] to be [illegible]
It [illegible] [illegible] in [illegible] [illegible] [illegible]
[illegible] that a [illegible] [illegible] is [illegible],

is due to the [illegible] [illegible] of the [illegible] and the blood supply through the [illegible] [illegible] brought to the cells or an increased [illegible] [illegible]. An [illegible] [illegible] [illegible] [illegible] it [illegible] the [illegible] [illegible], [illegible] in the [illegible] that [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

## Practical Conclusions.

Use of Inspiration. A deep inspiration [illegible] [illegible] [illegible] [illegible], and [illegible] shows that the greatest part of the [illegible] [illegible] is [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], [illegible] and other [illegible].

and continuing more rapidly as it is prolonged, as the case [illegible]. The curves plotted to show the relation of salt to germination approximate to a definite time percentage at equal intervals of time for each concentration. This relationship is to be discussed in another place. Stiles has studied the rate of germination [illegible] the [illegible] [illegible] comparing the results [illegible] [illegible] that the [illegible] of the [illegible] [illegible] than that of the [illegible].

Effect of concentration and dilution. It has been stated that [illegible] physiological [illegible] of the solution may be changed. A solution containing [illegible] [illegible]. The effects of [illegible] changes were also

[illegible]

[illegible] between the [illegible] and the head. — The [illegible] between the [illegible] [illegible] the head [illegible] [illegible] the [illegible] of the [illegible] and the [illegible] of the [illegible] are both

[illegible] by that more rapid development together and their tendency to more [illegible] changes in form. Some of the [illegible] indication that the upper part of the [illegible] increases the size of the lower part when there is continuity between the two. The following experiment [illegible] this statement. An [illegible] was cleft by a longitudinal cut and the [illegible] of the [illegible] [illegible] of two [illegible] [illegible] the [illegible] [illegible] cut [illegible] through [illegible] the separation was made complete. After that [illegible] the [illegible] from the lower [illegible] [illegible] [illegible] than the [illegible] [illegible] [illegible] the [illegible] longitudinal [illegible] by [illegible] in the same direction. [illegible] be placed that the upper half of one and the

lower half of the cheek could be quickly red- [illegible]. After two hours and a half this was done. In my case the reversal took a moment attended to the heart and in the same the lower portions. It was not continued to contract the lower heart center. Such results speak [illegible] suggestion of the [illegible] of the heart and the application of the Humoral theories.

An effort was made to see whether a like resemblance to the heart could be demonstrated with regard to the effect of salty [illegible] or drugs from different levels. [illegible] has found that the greater part [illegible] of the [illegible] [illegible] [illegible] [illegible] from the [illegible] [illegible] the [illegible] [illegible] being [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of [illegible] [illegible] parts of the [illegible] [illegible] [illegible] [illegible]

of the head, but at once on Magnus. It is probable that the frog kept [illegible] for a longer time in a weak solution, but the same independence between the injury and the [illegible] is remarkably exhibited. It was found [illegible] [illegible] of these experiments is [illegible] therefore, the [illegible] but the results obtained are not conclusive. In little [illegible], as 0.003% [illegible] a [illegible] effect [illegible] and in [illegible], but as has been stated, the [illegible] solution containing 0.005% [illegible], is more effective.

## Conclusions.

1. The [illegible] of the frog has a much more [illegible] [illegible] than that [illegible] by the other parts of the head. In the [illegible] [illegible] the [illegible] is [illegible].

reached at the theoretical end point, a some-
what unfavorable condition than the [illegible] when
the ratio of these [illegible] (? to the
reagents) is such that it may be [illegible]
[illegible] there should be determinable [illegible]
[illegible] of iron.

2. The [illegible] of [illegible] and [illegible] [illegible]
[illegible] to the determination of the [illegible]
[illegible] for very [illegible] of iron. [illegible]
the case of the [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] and [illegible] the [illegible]
0.1 [illegible] [illegible] [illegible] [illegible] and [illegible]
respectively. The [illegible] of these [illegible] [illegible]
[illegible] [illegible] 0.1% [illegible] [illegible] [illegible]
[illegible] and may be [illegible] [illegible].

3. No [illegible] for [illegible] has been
found. It is probable that this [illegible] [illegible]
[illegible] by the [illegible] [illegible] [illegible]
is [illegible] to the [illegible] [illegible] or [illegible]

ways. The evidence at present does not justify a dogmatic [illegible] between the two theories of [illegible] [illegible] [illegible]. It seems that [illegible] is a known factor and that $V_1$ and $V_2$ are [illegible] [illegible] in modifying the [illegible] [illegible] [illegible] ([illegible] term) [illegible]. It is more natural to interpret the results as [illegible] [illegible] [illegible] [illegible] for $V_1$ and [illegible] [illegible] [illegible] for $V_2$. The [illegible] [illegible] of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] at all [illegible] the agreement that [illegible] [illegible] [illegible] to $V_1$ [illegible] [illegible] rather than one which is [illegible] and [illegible] the agreement between the [illegible] and the [illegible] [illegible] of the [illegible] [illegible] [illegible] that [illegible] [illegible] the [illegible] [illegible] that Russell reached as the result of his study of the tongue and mouth.

4. The [illegible] [illegible] is not specifically [illegible]

quired for normal diaphragm activity. The place of [illegible] are many [illegible] [illegible] through the walls in the [illegible]

5. Hypertrophy of the [illegible] and that the diaphragm contractions.

6. [illegible] [illegible] of the [illegible] appears from one side to the [illegible] of the [illegible] [illegible] during the contraction [illegible] [illegible] [illegible] there. If the [illegible] [illegible] [illegible] [illegible] [illegible].

7. [illegible] [illegible] [illegible] the most [illegible] than the [illegible] [illegible] [illegible] [illegible] [illegible] and the [illegible].

My acknowledgements are due to [illegible] who proposed the research and helped the [illegible] by many helpful suggestions.

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

13 [illegible] Journal 1901 p. 1179
14 [illegible] Journal of [illegible] 1899 [illegible] 98
15 Comptes [illegible]
1908 [illegible] p. 545
16 [illegible]
1908 [illegible] p. 20

[illegible] [illegible] [illegible] was born in [illegible], [illegible], July 1, [illegible]. [illegible] the public schools of [illegible], entered the Massachusetts Institute of Technology in 1883, graduating in 1887 with the degree of Bachelor of Science in Biology. He was assistant in physiology at the same institution during the [illegible] years following and became [illegible] in [illegible]. He was also [illegible] in the Yale Medical School [illegible]. He entered Clark University in [illegible] [illegible] [illegible] [illegible] of the [illegible] with [illegible] and physiological [illegible] in [illegible] and social development. He was appointed [illegible] in 1900 and [illegible] in 1901.